NON-PUBLIC?: N
ACCESSION #: 9101160001
LICENSEE EVENT REPORT (LER)

FACILITY NAME: D.C. Cook Nuclear Plant - Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000316

TITLE: Reactor Protection System Actuation Caused by a Steam-to-Feedwater Flow Mismatch in Combination with Low Steam Generator Level
EVENT DATE: 12/12/90 LER #: 90-012-00 REPORT DATE: 01/11/91

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: P. F. Carteaux - Safety and Assessment Superintendent TELEPHONE: (616) 465-5901

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On December 12, 1990 at 0318 hours, the Unit 2 reactor tripped as a result of steam-to-feedwater flow mismatch (difference between steam and feed flows on one of two measured channels of each parameter for a steam generator (SG)) in coincidence with low SG level (one of two SG narrow range channels for a SG) conditions in the number 4 SG. These conditions arose following a trip of one of the two Turbine Driven Main Feedwater Pumps (TD-MFWP) due to an erroneous actuation of the turbine thrust bearing wear/shaft position detection alarm and trip device. No malfunctions of safety-related systems or components occurred.

The turbine thrust bearing wear/shaft position detection device was removed from the MFWP turbine driver and inspected. This device, and the similar device on the other turbine driver, were bench calibrated and

properly set-up on the MFWP turbines at turning gear and no-load operating speeds.

END OF ABSTRACT

Conditions Prior to Occurrence

Unit 2 in Mode 1 at 100 percent of Rated Thermal Power (RTP).

Description of Event

At approximately 0318 hours on December 12, 1990 the Unit 2 (U2) West MFWP (EIIS/SJ-P) turbine (EIIS/SJ-TRB) tripped due to a signal from the turbine thrust bearing wear/shaft position detector device (EIIS/JK-38). The Operators responded to the control room annunciators (EIIS/IB) by starting an additional condensate booster pump (EIIS/SD-P) (to assist the remaining MFWP), manually increased speed of the remaining MFWP, and began reducing unit power in an attempt to keep the unit on line. However, in the 43 seconds that ensued between the West MFWP turbine trip and reactor trip, they were not able to offset the loss of one MFWP at the existing unit power level and the mismatch in steam-to-feedwater flow (EIIS/JE-FFS) coincident with low steam generator (EIIS/AB-BLR) level (EIIS/JE-LS) (all in the loop 4 SG) initiated the reactor trip.

Opening of the reactor trip breakers (EIIS/JE-BKR) , turbine trip (EIIS/TA-TRB), control rod insertion, feedwater isolation (EIIS/JB), and automatic starting (EIIS/JB) of the two MDAFPs (EIIS/BA-P) and the TDAFP (EIIS/BA-P) occurred as expected.

Operating personnel concurrently performed the applicable Emergency Operating Procedures (EOPs') to verify proper automatic protection system responses and assess appropriate recovery actions for the indicated plant conditions.

Cause of the Event

The event is believed to have resulted from some combination of the following three factors related to the West MFWP turbine shaft position device:

1. Improper adjustment of the device during installation and/or later trouble-shooting, leaving the device with much less than the expected margin to trip

2. Shifting of the device on the turbine as a result of normal vibration despite the hold-down bolts,

3. Foreign material becoming trapped (or wedged) between the shaft thrust bearing face and the sliding shoe (which rides on the face).

These BBC shaft position devices are supposed to be calibrated as part of their manufacturing process, however the post-trip inspection disclosed that all the adjusting screws had been moved from their initial settings. This may have occurred when the device was initially set-up on the turbine during the refueling overhaul, or later during trouble-shooting on the device with the turbine in operation. The west MFWP had been overhauled during the refueling with the assistance of the equipment vendor. However, it can not be determined from records if the device had been set as required with the MFWP turbine on turning gear and again at no-load operating speed conditions. Also, eight days after the initial U2 power ascension following the refueling, the shaft position alarm (EIIS/IB-ZA) began intermittently alarming in the control room. The position device was checked locally (at the turbine) and was indicating "O" deflection. Other indications of bearing problems, such as excessive temperature or vibration, also did not exist (for both the alarm problem and the later trip). Plant maintenance personnel at that time tried to adjust the device while it was installed on the MFWP (with it's trip function disabled) using vendor information for guidance. At that time the device was left with free travel in the "+" and "-" directions of shaft motion. Following the trip, the device was found with it's travel in the "+" direction entirely used up. The investigation of the device indicated no reason why it would suddenly shift from a "trip free" to a "hard trip" condition as all adjustment screws were found tight. The device is bolted to the thrust bearing housing with two hold-down bolts. The post-trip inspection found some foreign material on the sliding shoe.

Analysis of Event

This report is being submitted in accordance with 10 CFR 50.73, paragraph (a) (2) (iv) as a result of the unplanned actuation of the Unit 2 RPS and ESF.

The automatic protection functions were verified to have functioned properly. The event did not involve an unreviewed safety question as defined in 10 CFR 50.59 paragraph (a) (2), and did not adversely impact the health and safety of the public.

Corrective Action

The shaft position device was removed from the W-MFWP turbine driver and inspected. This device, and the similar device on the E-MFWP turbine driver, were then bench calibrated and properly set-up on the MFWP turbines at turning gear and no-load operating

speeds. Lock washers were used with the hold-down bolts for the device on the W-MFWP when it was re-installed, following the post-trip calibration, on the W-MFWP.

To prevent recurrence no adjustments of these devices will be attempted while mounted on an operating MFWP turbine. A plant procedure, incorporating the appropriate vendor instructions will be developed to assure the calibration and set-up is done properly.

Failed Component Identification

Plant I.D. No.: 2-138-BSPW (Unit 2, West Main Feed Pump Turbine, OME-84W, Thrust Wear Test Open Limit
Switch)
Manufacturer: Brown-Boveri (BBC)
Model No: Shaft Position Supervisor,
drawing no. HTGD 90-142
EIIS Code: EIIS/JK-38

Previous Similar Events

None.

Indiana Michigan
Power Company
Cook Nuclear Plant
P.O. Box 458
Bridgman, MI 49106
616 465-5901
INDIANA
MICHIGAN
POWER

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United States Nuclear Regulatory Commission
Document Control Desk
Rockville, Maryland 20852

Operating Licenses DPR-75
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Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled
Licensee Event Reporting System, the following report is being submitted:

90-012-00

Sincerely,

A.A. Blind
Plant Manager

AAB:sb

Attachment

c: D.H. Williams, Jr.
A.B. Davis, Region III
M.P. Alexich
P.A. Barrett
J.E. Borggren
R.F. Kroeger
B. Walters - Ft. Wayne
NRC Resident Inspector
T. Colburn - NRC
J.G. Keppler
M.R. Padgett
G. Charnoff, Esq.
Dottie Sherman, ANI Library
D. Hahn
INPO
S.J. Brewer/B.P. Lauzau
B.A. Svensson

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